



Chapter Four

ASSESSMENT OF EXISTING RESOURCE

4.1 Soils of Lincoln Park

Varied soil types are found in Lincoln Park, due to the park's size, its breadth of terrain types, and alterations due to building construction, active management and human use. Natural forces have resulted in deposits of Seattle series soil in the flat area above the shore bluff that makes up most of the Park. Seattle series soil is characteristically poorly drained, being composed of mucky organic material. The beach is composed of deposits of coastal beach coarse soil common along much of Puget Sound. The bluff area is predominantly Seattle series soil overlying coarser till and hardpan, which are exposed through erosion and landslides. See Map F-4, Appendix F.

4.2 Slope Stability and Erosion

Landslides are a regular and inexorable part of Lincoln Park's bluff history. See Map F-3 – Critical Areas, Appendix F. The most recent major slide occurred in the mid-1990's. Large landslides result from inherent geological conditions of a site, reflecting the interaction of moisture with soil physical properties. Where slides occur, vegetation generally is lost and poorly developed subsoils become exposed. Surface erosion and colonization by weedy herbaceous and woody species often ensue. Such consequences are evident along Lincoln Park's bluffs. Revegetation can be difficult, if not impossible to achieve, and the risk of loss through subsequent mass waste event remains.

Large woody vegetation such as trees can contribute somewhat to slope instability, particularly where found growing in Seattle series soil. This poorly-drained soil typically generates shallow root systems in most species, and potentially leads to failure when coupled with severe wind and/or heavy precipitation. Resident bluff vegetation, whatever its composition, can neither cause nor prevent large-scale landslides; these are attributable to far more deepseated geological and hydrological conditions.

Vegetation can help reduce erosion which might otherwise occur as a result of natural processes. Plants serve to reduce the erosive action of rainfall by means of direct rain interception, ground water transpiration, and improved soil drainage. Trees, shrubs and herbs intercept and slow the rate at which storm water hits the ground. Plant roots absorb water from the soil and release it into the atmosphere during photosynthesis. Roots create channels in soil that facilitate oxygen and water infiltration. Organic matter from mulch, leaves, needles and branches acts like a sponge on the ground, slowing ground water movement. Decaying plant parts, together with soil microorganisms (bacteria, fungi, etc.) and macrofauna (earthworms, ants, etc.), create pore space and improve soil aggregation. Conversely, lack of vegetation and compacted bare soils contribute to erosion.

4.3 Vegetation Plot Inventory Methods

A plot survey of Lincoln Park vegetation was conducted between March and May of 2001. Forty 1/10-acre circular plots were selected to represent the variety of vegetation types present at Lincoln Park. The location of the survey plots is shown in **Figure 4-1**. **Table 4-1** provides a sample of the field survey sheet utilized.

Tree species and physical structure were recorded for each plot, and coded as follows: 1 = <1-4" dbh (diameter at breast height, or 4.5' above ground), 2 = 5-8" dbh, 3 = 9-20" dbh, 4 = 21-31" dbh, 5 = 32+" dbh, and 6 = "Multi-storied canopy." All visible shrub, herb and fern species were



noted, and percentage of a plot covered by a given species also recorded (% Cover). The percent tree canopy cover was approximated for each plot.

Estimated overall seral stage of each plot was recorded as follows: 1 = old growth (180+ years), 2 = late mature (120-180 years), 3 = mid-mature (60-120 years), 4 = early mature (30-60 years), 5 = sapling - small tree <1" to 5" dbh, and 6 = shrub pioneer (less than 10% tree canopy closure).

The soil was sampled and its general composition recorded for each plot, based on dominant particle size. Soils dominated by clay were recorded as "clay"; those dominated by sand were recorded as "sand", etc. The percent slope and aspect were recorded for each plot. Finally, counts of downed woody debris and snags were recorded.

Supplemental, qualitative vegetation sampling was performed in April of 2002. Park vegetation not been previously assigned random sample plots or amenable thereto was visually assessed. Plant species present, plant health problems and unique landscape features were recorded. Developed landscape areas in particular were evaluated in this manner, in addition to gaps in previous coverage.

4.4 Vegetation Inventory Analysis

On the basis of dominant vegetation recorded by plot inventory, Lincoln Park has been divided into thirteen distinct Vegetation Zones (Zones A-M). Zones largely correlate to geographical location within the park, but were not delineated by that means. A map depicting the area of each can be found in **Figure 4-2**. Lincoln Park Existing Vegetation Zones include:

Zone A	Beach Vegetation
Zone B	Bigleaf maple/red alder/Douglas-fir Forest
Zone C	North Mixed Native/Non-native Landscape
Zone D	Grand Fir/ Western Red Cedar Forest
Zone E	Turf and Ballfields
Zone F	Central Greensward
Zone G	Bigleaf Maple/Red Alder Forest
Zone H	Douglas Fir/Red Alder Forest
Zone I	Pacific Madrone/Red Alder/Douglas Fir Forest
Zone J	Pacific Madrone/Douglas Fir Forest
Zone K	Forest Clearing
Zone L	Lawson Cypress/Western Red Cedar Forest
Zone M	South Greensward

Zones vary in composition from highly managed landscapes and lawns to native forest remnants. The character of vegetation in individual zones has been influenced by microclimate and related plant demographics, by active landscape management by Parks employees and volunteers, by presence of disease pockets, and by nature and intensity of human use. Detailed descriptions of individual zones follow.

In forested zones, the most common and oldest tree species are noted as the "dominant tree species", while shrub species covering over 10% of forested zones are recorded as "dominant shrub species." For partially-forested zones, dominant species percentages refer to only the forested portions of such zones. Common herbaceous species present within zones are recorded as "significant herbs." Invasive species, which either cover large portions of a zone or are capable of doing so, are noted as "significant invasive species."



All percentages recorded above were derived from the 2001 park vegetation plot survey. Where percentages are absent, it is the result of supplemental, non-quantitative surveys conducted by Seattle Parks staff. A category which does not apply for a given zone is designated “n/a”, for example “dominant tree species” for the Beach Vegetation Zone.

4.5 Existing Vegetation Zones

Zone A - Beach Vegetation

Acreage:	9.3
Aspect:	West
Slope:	0-40%
Soils Present:	Sand
Canopy Closure:	0-40%
Dominant Trees:	n/a
Dominant Shrubs:	n/a
Significant Herbs:	Some beach grasses present
Significant Invasive Plants:	Some scotch broom and gorse present
Down Woody Debris (average/acre):	High (driftwood)
Snags (average/acre):	0

The Beach Zone harbors only periodic pockets of vegetation along the lengthy Puget Sound beach itself. Existing grasses likely were planted by Seattle Parks as part of past beach reclamation/naturalization efforts.

The landscape immediately surrounding Colman Pool consists of ornamental shrubs (rose, rhododendron) and lawn punctuated by mature, non-native black locust trees (*Robinia pseudoacacia*). Probably as a result of lawn mowing, invasive plants have been largely unable to achieve significant populations in this area. This ornamental landscape is slated for renovation in 2003.

A linear row of maple trees planted along the Promenade southward from Colman Pool contrasts with the more enclosed, natural character of vegetation along the rest of the beach walkway. An exception to this overarching vegetation is an open slide swath re-vegetated in grasses and being invaded by unwanted species. For additional information, see the 1988 Parks Dept. planning study titled “Lincoln Park Shoreline.”

Zone B - Bigleaf Maple/Red Alder/Douglas Fir Forest

Acreage:	11.1
Aspect:	West
Slope:	40%
Soils Present:	Highly variable
Canopy Closure:	40-80%
Dominant Trees:	Bigleaf maple, Red alder, Douglas fir
Dominant Shrubs:	English ivy (21%), Western hazel (12%), Indian plum (10%), Low Oregon grape (4%).
Significant Herbs:	Sword fern (33%), Moss (6%), Fringecup (3%), Stinging nettle (3%)
Significant Invasive Plants:	English ivy (21%), English holly (5%), Himalayan blackberry (1%).
Downed Woody Debris (average/acre):	500
Snags (average/acre):	30



Zone B is a natural wooded area originating at the top of a bluff and transitioning downward to the beach. The eastern portion is upland and essentially flat and western portion is steeply sloped. The steep slope poses erosion and landslide risk. Invasive plants cover significant portions of this zone. Removal of evergreen invasive plants may exacerbate erosion and slide risk.

Zone C - North Mixed Native/Non-native Landscape

Acreage:	10.4
Aspect:	East, North
Slope:	0-15%
Soils Present:	Not sampled
Canopy Closure:	40-60%
Dominant Trees:	Mixed native & non-native species, including Lawson cypress, Japanese cryptomeria, Douglas fir, Bigleaf maple and others.
Dominant Shrubs:	Mixed native & non-native species, including Rhododendron, Skimmia, European cranberry bush, Japanese camellia, English holly cultivars, Parney cotoneaster and others.
Significant Herbs:	Mixed native & non-native species, including Primrose, Sword fern and moss.
Significant Invasive Plants:	English ivy is common, often climbing up tree trunks.
Downed Woody Debris (average/acre):	Not sampled
Snags (average/acre):	Not sampled

Zone C contains a mixture of native, non-native and invasive plants. A Seattle Parks facilities maintenance compound is located in the northwest portion of this zone. A dozen or more Lawson cypress trees in this zone, mostly adjacent to crew headquarters, show signs of root disease (flagging patches on foliage). Removals due to presumed *Phytophthora lateralis* have occurred in the recent past, but without confirming lab culture.

Zone D - Grand fir/ Western red cedar forest

Acreage:	5.8
Aspect:	Flat
Slope:	0-15%
Soils Present:	Highly variable
Canopy Closure:	60-80%
Dominant Trees:	Grand fir, Western red cedar, Bigleaf maple
Dominant Shrubs:	Salal (24%), Hazelnut (24%), Ocean spray (9%)
Significant Herbs:	Sword fern (38%), Moss (6%), Bracken fern (4%)
Significant Invasive Plants:	English holly (2%)
Downed Woody Debris (average/acre):	60
Snags (average/acre):	30

The eastern edge of this zone contains significant stands of Coast redwood trees (*Sequoia sempervirens*). Social trails run through this zone on a north south axis. A large patch of English ivy (*Hedera helix*) runs along the zone's eastern edge.

**Zone E - Turf and Ballfields**

Acreage:	6.5
Aspect:	Flat
Slope:	0-15%
Soils Present:	Clay
Canopy Closure:	0%
Dominant Trees:	n/a
Dominant Shrubs:	n/a
Significant Herbs:	Non-native grass
Significant Invasive Plants:	Probably as a result of lawn mowing, invasive plants have not been able to achieve significant populations.
Downed Woody Debris (average/acre):	0
Snags (average/acre):	0

Zone E consists of a south and north athletic field. The north field is surrounded by a mixture of native and non-native conifers and madronas. Grass grows right up to the trunk on most of these trees. Mixed native and non-native conifers also surround the south field. Some large Western red cedars near the south field are exhibiting symptoms of water stress (flagging).

Zone F - Central Greensward

Acreage:	8.3
Aspect:	Northeast
Slope:	0-15%
Soils Present:	Clay
Canopy Closure:	0-60%
Dominant Trees:	Douglas fir, Lawson cypress, others
Dominant Shrubs:	Western hazel (associated with tree clumps)
Significant Herbs:	Sword fern (at tree clumps), Non-native grasses, Moss
Significant Invasive Plants:	Probably as a result of lawn mowing, invasive plants have not been able to achieve significant populations.
Downed Woody Debris (average/acre):	Not sampled
Snags (average/acre):	Not sampled

Zone F is predominately a lawn with individual trees or small islands of trees and shrubs interspersed throughout. Grass lawns in this area are poorly drained and soggy in wintertime; soils have a high clay content. Coast redwood trees over seventy feet tall border the adjacent athletic field. On the western edge is a significant grove of European beech trees (*Fagus sylvatica*). Significant downed woody debris is present in some portions of this zone despite its predominantly open, developed landscape character.

Zone G - Bigleaf maple/Red alder forest

Acreage:	9.2
Aspect:	West
Slope:	15-40%
Soils Present:	Highly variable
Canopy Closure:	40-80%
Dominant Trees:	Bigleaf maple, Red alder
Dominant Shrubs:	Hazelnut (17%), Red elderberry (10%), Ocean spray (8%), Trailing blackberry (6%)



Significant Herbs:	Sword fern (21%), Moss (17%)
Significant Invasive Plants:	Himalayan blackberry (14%), English ivy (7%), English holly (6%)
Downed Woody Debris (average/acre):	210
Snags (average/acre):	10

This zone consists of an eastern portion that is essentially flat, and a steeply-sloped western portion that levels off near Colman Pool. There exist panoramic views, windowed through trees along the western edge of the bluff trail. Walking trails and benches are highly used by visitors. Large numbers of invasive plants are found on the sloped forest in this zone. Many are evergreen species, dictating caution regarding any removals, to minimize risk of slope erosion and destabilization. Portions of this zone consist of small islands of trees and understory plants surrounded by lawn.

Zone H - Douglas fir/Red alder forest

Acreage:	23.4
Aspect:	Northeast, South, West
Slope:	0-15%
Soils Present:	Sand, Duff, Gravel
Canopy Closure:	40-80%
Dominant Trees:	Douglas fir, Red alder, Western red cedar
Dominant Shrubs:	Hazelnut (24%), Salal (6%), Ocean spray (7%)
Significant Herbs:	Sword fern (33%), Moss (25%), Enchanter's nightshade - <i>Circaea alpine</i> (11%)
Significant Invasive Plants:	Himalayan blackberry (6%), English ivy (6%), English holly (3%)
Downed Woody Debris (average/acre):	187
Snags (average/acre):	7

Zone H encompasses essentially healthy, native forest of varied density, composed primarily of conifers with significant numbers of deciduous trees. Several trails run through this zone, linking the bluff trail with other parts of Lincoln Park. Significant populations of invasive plants are found, and in some areas lawn grows right up to small islands of trees and understory shrubs. The southwestern edge of this zone contains significant populations of Pacific madrona (*Arbutus menziesii*) and salal.

Zone I - Pacific madrona/Red alder/Douglas fir forest

Acreage:	12.2
Aspect:	Southwest
Slope:	0-15%
Soils Present:	Sand, Duff, Gravel
Canopy Closure:	60-80%
Dominant Trees:	Pacific madrona, Red alder, Douglas fir
Dominant Shrubs:	Hazelnut (45%), Salal (26%), Red elderberry (17%), Trailing blackberry (15%), Ocean spray (%)
Significant Herbs:	Moss (20%), Sword fern (15%), Enchanter's nightshade - <i>Circaea alpina</i> (3%), Lady fern (1%)
Significant Invasive Plants:	English holly (9%), English laurel (2%), English ivy (1%)



Downed Woody Debris (average/acre): 254
Snags (average/acre): 26

Zone I is a natural forested area with a mixture of deciduous and evergreen species. Portions are poorly drained and contain plant species indicative of wetland conditions, such as Salmonberry (*Rubus spectabilis*) in the western half. Snags in the zone show evidence of use by primary cavity-nesting birds like woodpeckers.

Zone J - Pacific madrone/Douglas fir forest

Acreage: 8.3
Aspect: Southwest
Slope: 0-80%
Soils Present: Highly variable
Canopy Closure: 0-80%
Dominant Trees: Pacific madrona, Douglas fir
Dominant Shrubs: Western hazel (43%), Salal (37%), Orange honeysuckle - *Lonicera ciliosa* (9%), Snowberry (9%)
Significant Herbs: Moss (8%), Bracken fern (10%), Riverbank lupine - *Lupinus rivularis* (6%)
Significant Invasive Plants: English ivy (10%), Himalayan blackberry (6%)
Downed Woody Debris (average/acre): 81
Snags (average/acre): 23

Zone J is a forested area containing a mixture of native and non-native tree species. The eastern portion is a flat area adjoining the bluff trail. Picnic tables are scattered among many trees in this part of the zone; trees in picnic areas are potentially hazardous. At least half of madrona trees in this zone exhibit severe cankers, most likely caused by *Natrassia mangiferae*, a highly-virulent, non-native fungal pathogen. Other factors such as compacted soils and lawn fertilization may also be adversely affecting the madronas (see Appendix C). A small seasonal stream runs through this zone and disappears under a staircase connecting bluff trail and beach.

The western portion is a steep slope that levels off near the beach trail. Landslides have occurred recently in the northwestern portion of this zone. The rest of the slope has the potential for further erosion or landslides. Invasive plants cover large portions of both flat and sloped areas. The removal of evergreen invasive plants may exacerbate erosion and slide risk on steep slopes.

Zone K - Forest Clearing

Acreage: 1.0
Aspect: East
Slope: 0-15%
Soils Present: Sand, Duff, Gravel
Canopy Closure: 0-40%
Dominant Trees: n/a
Dominant Shrubs: Himalayan blackberry
Significant Herbs: Non-native grass
Significant Invasive Plants: Himalayan blackberry
Downed Woody Debris (average/acre): 200
Snags (average/acre): 0



A small seasonal stream runs through this zone and is essentially unbuffered except by grass and a patch of blackberry. Although small, this drainage could become a valuable asset for wildlife habitat enhancement. It continues southwest from this zone through adjacent Zone J, where it disappears in the vicinity of the bluff. A large lawn area with picnic benches is present in this zone. The area is also used by park visitors as a non-designated dog run. Most of the lawn is poorly drained, resulting in a wet soggy field during the rainy season. A large (45' tall) dead pine tree is located at the eastern edge of this zone, among other pines in varying condition from vigorous to nearly dead. Shading, poor drainage and root rot are potential contributing causes.

Zone L - Lawson cypress/Western red cedar forest

Acreage:	1.7
Aspect:	Flat
Slope:	0-15%
Soils Present:	Sand, Duff, Gravel
Canopy Closure:	60-80%
Dominant Trees:	Lawson cypress, Western red cedar
Dominant Shrubs:	English ivy (46.3%), Western hazel (26.8%), Western mock orange (25.5%), Trailing blackberry (13%)
Significant Herbs:	Sword fern (10.5%), Non-native grass (9.4%)
Significant Invasive Plants:	English ivy (46.3%), English holly (5%), Himalayan blackberry (3%)
Downed Woody Debris (average/acre):	50
Snags (average/acre):	20

Zone L is the southerly portion of the edge at Fauntleroy Street. This Zone contains a mixture of native forest species and non-native, ornamental trees and shrubs planted along the eastern edge of this zone. Invasive plants are present in large numbers. Some trees have been removed from this zone because of probable *Phytophthora*-caused fungal disease. This often-fatal plant pathogen can spread to other trees in the area via runoff or mud carried on shoes and by animals.

Zone M - South Greensward

Acreage:	5.6
Aspect:	Southwest
Slope:	40%
Soils Present:	Sand, Gravel
Canopy Closure:	0-40%
Dominant Trees:	Bigleaf maple, Pacific madrona
Dominant Shrubs:	English ivy (37.5%), Himalayan blackberry (20.5%), Gorse (8%)
Significant Herbs:	Non-native grass (10.8%), Orchard grass - <i>Dactylis glomerata</i> (10.5%), Bracken fern (5%)
Significant Invasive Plants:	English ivy (37.5%), Himalayan blackberry (20.5%), Orchard grass (10.5%), Gorse (8%), English holly (3.8%)
Downed Woody Debris (average/acre):	130
Snags (average/acre):	0

Dominant trees and shrubs listed pertain only to forested areas. Over half of this zone consists of lawn with scattered clumps of native and non-native trees. A play area is located in this zone, surrounded by large Douglas fir and Madrona trees. High human use has resulted in vegetation



trampling and compaction around root zones of these late-mature trees. Coarse-textured soils like those present in this zone can resist compaction and successfully prevent oxygen-deprived root environments from developing. Most madronas in the area show signs of attack by *Natrassia mangiferae*, particularly severe where bark on lower trunks has been wounded either by visitors or maintenance operations. Madronas protected by understory vegetation or peripheral to active use areas are somewhat less affected by cankers. Some trees may be hazardous due to their large size and failure potential coupled with the area's high frequency of human use.

4.6 Wildlife Habitat

The Seattle Parks Urban Wildlife and Habitat Management Plan was updated in 2000 and defines its purpose as:

“to provide the framework and guidelines for integrating natural and human systems in Seattle's parks and open spaces. The overall goal of the plan is to benefit both the people and the native wildlife that use these lands...and is intended to be an ongoing and dynamic part of the resource management efforts.”

Stated goals, which the Lincoln Park VMP will support, are as follows:

- Continue and increase wildlife habitat protection and enhancement efforts
- Protect and enhance wildlife populations
- Provide environmental education, using wildlife resources
- Develop and maintain a wildlife resource inventory
- Promote volunteer involvement in wildlife and habitat protection and enhancement
- Promote internal education and consistency in Department actions
- Promote interdepartmental and interagency cooperation to protect wildlife

The plan describes the network of habitats in Seattle, which range from sub-tidal marine to old-growth conifer forest, and include terrestrial, marine estuarine and freshwater environments. In addition to this plan, the Seattle Urban Nature Project has completed a comprehensive inventory assessing the city's public habitat resources; this inventory will be updated in 2005 to reflect dynamic change in the direction of both habitat restoration and degradation or destruction. Both types of forces clearly are at work simultaneously.

Lincoln Park has stands of coniferous and deciduous forest large enough to support an array of wildlife species. The more complex plant communities, that is, those with multiple layers of vegetation, will provide the greatest variety of wildlife habitat. Diversity of bird species in particular increases with a greater volume of foliage and more vegetative cover.

Lincoln Park also has a large area of saltwater beach providing intertidal habitats for a great variety of mammals, marine fauna and birds including gulls, crows, shorebirds, harbor seals and waterfowl. Dogs and humans using the beaches often disturb the wildlife, forcing them to more quiet areas.

No detailed lists of wildlife species confirmed to inhabit Lincoln Park have been compiled. The documented range of habitat types within the park do give a good indication of likely fauna, present or potential. The Urban Wildlife plan contains a list of vertebrate animal species known to occur in Seattle Parks, by habitat type. In addition, Washington Department of Fish and Wildlife maintains a list of fauna meriting priority for protection due to their sensitivity to habitat alteration. Several frequent Lincoln Park The State list includes:



- Bald Eagles (known to nest in Lincoln, Discovery and Seward Parks)
- Chinook Salmon
- Northern Red Legged Frog
- Hooded Merganser
- Peregrine Falcon
- Great Blue Heron
- Green Heron
- Pileated Woodpecker

Unfortunately, habitat degradation is occurring in all Seattle Parks due to human use impacts on the natural system. Lincoln is no exception. Where non-native plants crowd out native species, the resulting lack of diversity yields habitat both less functional and less attractive to most wildlife. Uncontrolled cats and dogs constitute unnatural predators and further threaten terrestrial species. Additionally, wildlife corridors are being broken apart by land development, fragmenting existing habitat and making it less viable for many bird and animal populations. Lincoln Park currently provides refuge and opportunities for high-quality habitat preservation and creation. Appropriate vegetation management directly serves goals of wildlife enhancement.

4.7 Encroachments

There are no known encroachments to Lincoln Park boundaries.